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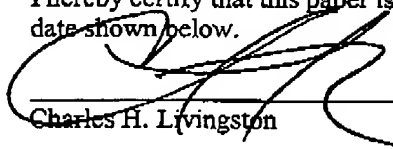
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Applicant's Name: Etsuo MORITA

Serial No. (Control No.): 09/728,193

Examiner: Matthew J. Song

Filing Date

November 30, 2000

Art Unit: 1765

Application Title: METHOD OF MANUFACTURING CRYSTAL OF III-V COMPOUND OF THE
NITRIDE SYSTEM, CRYSTAL SUBSTRATE OF III-V COMPOUND OF THE
NITRIDE SYSTEM, CRYSTAL FILM OF III-V COMPOUND OF THE
NITRIDE SYSTEM, AND METHOD OF MANUFACTURING DEVICE

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In re Patent Application of:

Etsuo MORITA

Group Art Unit: 1765

Application No.: 09/728,193

Examiner: Matthew J. Song

Filed: November 30, 2000

For: METHOD OF MANUFACTURING CRYSTAL OF III-V COMPOUND OF THE NITRIDE SYSTEM, CRYSTAL SUBSTRATE OF III-V COMPOUND OF THE NITRIDE SYSTEM, CRYSTAL FILM OF III-V COMPOUND OF THE NITRIDE SYSTEM, AND METHOD OF MANUFACTURING DEVICE

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BRIEF ON APPEAL

This is an appeal from the final rejection of the above-identified application made in the Final Office Action mailed April 7, 2004. A Notice of Appeal was submitted by facsimile on August 12, 2004.

I. Real Party in Interest

The assignee of record, Sony Corporation, a Japanese corporation, is the real party in interest in the present appeal. The inventor, Etsuo Morita, assigned the invention to Sony Corporation.

II. Related Appeals and Interferences

Appellant, his assignee and their legal representative are unaware of other appeals or interferences that would directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

Claims 1, 2, 4-20, and 23-26 are pending in the present application and stand rejected. A copy of the pending claims is attached as an appendix.

Claims 3, 21, and 22 have been canceled.

The rejection of claims 1, 2, 4-20, and 23-26 is being appealed.

IV. Status of Amendments

After the final rejection, an amendment was filed under 37 C.F.R. § 1.116 amending claim 23. The amendment was entered.

V. Summary of Claimed Subject Matter

Briefly, the present invention relates to a method of manufacturing a device, such as a semiconductor laser device, a crystal substrate of a III-V compound of a nitride system, a crystal film of a III-V compound of the nitride system, and a method of manufacturing a crystal of a III-V compound of the nitride system. U.S. Patent Application Serial No. 09/728,193, Specification, page 1, lines 9-14. A gallium nitride (GaN) crystal is grown over a basal body 11 to form a base crystal layer 12. *Id.* at page 8, lines 16-20. Over the surface of the base crystal layer 12, a layer of silicon dioxide (SiO₂) or silicon nitride (Si₃N₄) is deposited and patterned to form a first mask pattern 13. *Id.* at page 8, lines 21-24, and page 9, line 1. The first mask pattern 13 has a number of parallel stripes 130 arranged at intervals. *Id.* at page 9, lines 1-2. An intermediate crystal layer 14 is deposited by growing a gallium nitride (GaN) crystal layer over the surface of the base crystal layer 12. *Id.* at lines 6-8. The intermediate crystal layer 14 is grown to become thick enough to completely cover the first mask pattern 13. *Id.* at lines 11-12. A layer comprised of silicon dioxide (SiO₂) or silicon nitride (Si₃N₄) is deposited over the surface of the intermediate crystal layer 14 and patterned to form a second mask pattern 15. *Id.* at lines 14-18. The second mask pattern comprises a number of stripes 150 arranged at intervals in the same direction as the first mask pattern 13. *Id.* at lines 18-20. A top crystal layer 16 is deposited by growing a gallium nitride (GaN) crystal layer over the surface of the intermediate crystal layer 14. *Id.* at lines 22-24. The top crystal layer 16 is grown to become thick enough to completely cover the second mask pattern 15. *Id.* at page 10, lines 3-5. The pitches of the first mask pattern 13 and the second mask pattern 15 are defined by the sum of the width and interval of the stripes 130, 150, respectively. *Id.* at lines 19-24. In one embodiment, the pitches of the first mask pattern 13 and the second mask pattern 15 are different from each other. *Id.* at page 11, lines 1-2. There is a region R in which the stripes of one mask pattern overlie the windows

of another mask pattern. *Id.* at lines 2-4. Over the region R, a semiconductor laser device is made. *Id.* at lines 4-5.

VI. Grounds of Rejection to be Reviewed on Appeal

Claims 1, 2, 4, 7, 11-20, and 23-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,952,526 (Pribat).

Claims 1, 2, 4, 7, 11-15 and 23-26 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,294,440 (Tsuda).

Claims 1, 4-6, and 8-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Pribat or Tsuda in view of U.S. Patent No. 6,358,854 (Fleming).

VII. Argument

A. Rejection of claims 1, 2, 4, 7, 11-20, and 23-24 as unpatentable over Pribat

1. Claims 1, 2, 4, 7, and 11-20:

Claims 1, 2, 4, 7, and 11-20 stand improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,952,526 (Pribat).

Claims 1, 2, 4, 7, and 11-20 are patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claims 1, 2, 4, 7, and 11-20 recite a method of manufacturing a crystal of a III-V compound of a nitride system. The method comprises, among other things, forming a first plurality of patterns of at least one pitch, in one position in a direction of a thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein the second plurality of patterns at least partly overlies the first plurality of patterns in the direction of the thickness of the crystal and at least partly does not overlie the first plurality of patterns in the direction of the thickness of the crystal, and *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

As stated on page 5 of the Final Office Action, Pribat does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, *wherein the pitch of pattern elements of the first plurality of*

patterns and the pitch of pattern elements of the second plurality of patterns are different from each other. It would not have been obvious to modify Pribat to obtain the claimed invention. The Examiner has not shown a suggestion or motivation in Pribat or in the knowledge generally available to one of ordinary skill in the art to modify Pribat to obtain the claimed invention. Therefore, the Examiner has failed to meet his burden of proving a *prima facie* case of obviousness.

On page 9 of the Final Office Action, the Examiner states, "Pribat teaches various size [sic] of apertures and bands and that the size of the apertures affects the thickness of the monocrystalline layer.... Therefore, because the width of each gap 43,44,45 can be optimized to produce a uniformly thick monocrystalline silicon layer; the pitch will be different because the pitch is dependent on the width of a stripe and the width of the interval of a stripe..." Pribat teaches apertures between 1 and 20 micrometers and that the apertures can be too wide to obtain monocrystalline silicon layers of uniform thickness. However, Pribat does not teach or suggest producing two separate patterns having different pitches from one another. Rather, Pribat merely teaches a range of exemplary widths and suggests limiting the width of each of the apertures to grow layers of a uniform thickness. Furthermore, even if the apertures of two separate patterns are different, depending upon the lengths of the dielectrics the pitches of the separate patterns are not necessarily different. For example, in Fig. 19 Pribat appears to illustrate separate patterns having different aperture widths from one another. However, because the lengths of the dielectrics are different, the pitches are generally the same (each measured at about 2.5 inches). On page 2 of the Advisory Action dated July 7, 2004, the Examiner states that Figure 14 of Pribat shows a slightly different pitch between the patterns. However, the pitches in Figure 14 are the same (each measuring about 1.1875 inches).

On page 9 of the Final Office Action, the Examiner asserted the difference in pitch is merely a change in the size of the gaps and stripes, and changes in size and shape may be obvious. Although changes in size and/or shape may be obvious when the change was not significant and/or did not result in a change in performance, changes in size and/or shape are not obvious per se. In the instant application, the change in size produces differing pitches to facilitate ensuring no dislocations reach the surface of a crystal substrate. Therefore the claimed invention is not obvious in view of Pribat.

Because Pribat does not disclose or suggest all the requirements of claims 1, 2, 4, 7, and 11-20, the claims are non-obvious over Pribat. Moreover, the Examiner has failed to

make a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claims 1, 2, 4, 7, and 11-20 be reversed.

2. Claims 23 and 24:

Claims 23 and 24 stand improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Pribat.

Claims 23 and 24 are patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claims 23 and 24 recite a method of manufacturing a device by forming a device film on a surface of one of a crystal substrate and a crystal film. Among other things, the method comprises forming a first plurality of patterns of at least one pitch in one position in a direction of the thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein the first plurality of patterns at least partly overlies the second plurality of patterns in the direction of the thickness of the crystal and at least partly does not overlie the second plurality of patterns in the direction of the thickness of the crystal, and *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

As discussed above, Pribat does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.* Because Pribat does not disclose or suggest all the requirements of claims 23 and 24, the claims are non-obvious over Pribat. In addition, the Examiner has failed to present a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claims 23 and 24 be reversed.

B. Rejection of claims 1, 2, 4, 7, 11-15, and 23-26 as unpatentable over Tsuda

1. Claims 1, 2, 4, 7, and 11-15:

Claims 1, 2, 4, 7, and 11-15 stand improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,294,440 (Tsuda).

Claims 1, 2, 4, 7, and 11-15 are patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claims 1, 2, 4, 7, and 11-15 recite a method of manufacturing a crystal of a III-V compound of a nitride system. The method comprises, among other things, forming a first plurality of patterns of at least one pitch, in one position in a direction of a thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein the second plurality of patterns at least partly overlies the first plurality of patterns in the direction of the thickness of the crystal and at least partly does not overlie the first plurality of patterns in the direction of the thickness of the crystal, and *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

Tsuda discloses a method for producing a semiconductor substrate including forming a first patterned mask 102 containing a material having a growth suppressing effect on a lower substrate, growing a semiconductor crystal 103 on the lower substrate via the first patterned mask to form a first semiconductor crystal layer, forming a second patterned mask 104 containing a material having a growth suppressing effect on or above the lower substrate, and growing a semiconductor crystal 105 on or above the lower substrate via the second patterned mask to form a second semiconductor crystal layer.

As stated on page 6 of the Final Office Action, Tsuda does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.* It would not have been obvious to modify Tsuda to obtain the claimed invention. The Examiner has not shown a suggestion or motivation in Tsuda or in the knowledge generally available to one of ordinary skill in the art to modify Tsuda to obtain the claimed invention, and therefore has failed to meet his burden of proving a *prima facie* case of obviousness.

On page 3 of the Advisory Action dated July 7, 2004, the Examiner states that Tsuda "teaches it is important to select the relationship between the size of each opening of the first mask 102 and the stripe width of the second mask 104, depending upon required characteristics of a light emitting device." The Examiner further states that the "elements that

make of a patterns pitch, the width of the stripe and the interval, are known in the art to be result effective variables" and therefore "the pitch of a pattern inherently is known to be a result effective variable." However, Tsuda does not teach or suggest selecting the relationship between the size of each opening of the first mask 102 and the stripe width of the second mask 104 to produce two separate patterns having different pitches from one another. Rather, the pitches of each pattern described and illustrated in Tsuda appear generally the same. Indeed, even though a size of a pattern opening and/or a stripe width of one pattern may be different from that of another pattern, the pitches of the separate patterns may not necessarily different, as is illustrated in Tsuda.

Because Tsuda does not disclose or suggest all the requirements of the claims, claims 1, 2, 4, 7, and 11-15 are non-obvious over Tsuda. In addition, the Examiner has failed to present a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claims 1, 2, 4, 7, and 11-15 be reversed.

2. Claims 23 and 24:

Claims 23 and 24 stand improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuda.

Claims 23 and 24 are patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claims 23 and 24 recite a method of manufacturing a device by forming a device film on a surface of one of a crystal substrate and a crystal film, the method comprising, among other things, forming a first plurality of patterns of at least one pitch in one position in a direction of the thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein the first plurality of patterns at least partly overlies the second plurality of patterns in the direction of the thickness of the crystal and at least partly does not overlie the second plurality of patterns in the direction of the thickness of the crystal, and *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

As discussed above, Tsuda does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch,

wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other. Because Tsuda does not disclose or suggest all the claim requirements of the claims, claims 23 and 24 are non-obvious over Tsuda. Further, the Examiner has failed to present a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claims 23 and 24 be reversed.

3. Claim 25:

Claim 25 stands improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuda.

Claim 25 is patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claim 25 recites a method of manufacturing a crystal of a III-V compound of a nitride system. Among other things, the method comprises forming a first plurality of patterns of at least one pitch, in one position in a direction of a thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein each of the first and the second plurality of patterns take form in pattern elements and at least one pattern element of the second plurality of patterns overlies a pattern element of the first plurality of patterns in the direction of the thickness of the crystal and *at least one pattern element of the second plurality of patterns does not overlie a pattern element of the first plurality of patterns in the direction of the thickness of the crystal*, and wherein *the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

As discussed above, Tsuda does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.* Additionally, as stated on page 7 of the Final Office Action, Tsuda does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, wherein each of the first and the second plurality of patterns take form in pattern elements and *at least one pattern element of the second plurality of patterns does not overlie a pattern element of*

the first plurality of patterns in the direction of the thickness of the crystal. It would not have been obvious to modify Tsuda to obtain the claimed invention. The Examiner has not shown suggestion or motivation in Tsuda or in the knowledge generally available to one of ordinary skill in the art to modify Tsuda to obtain the claimed invention, and therefore has not met his burden of proving a *prima facie* case of obviousness.

Because Tsuda does not disclose or suggest all the claim requirements of the claim, claim 25 is non-obvious over Tsuda. In addition, the Examiner has failed to present a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claim 25 be reversed.

4. Claim 26:

Claim 26 stands improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over Tsuda.

Claim 26 is patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claim 26 recites a method of manufacturing a device by forming a device film on a surface of one of a crystal substrate and a crystal film. The method comprises, among other things, forming a first plurality of patterns of at least one pitch in one position in a direction of the thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein each of the first and the second plurality of patterns take form in pattern elements and at least one pattern element of the first plurality of patterns overlies a pattern element of the second plurality of patterns in the direction of the thickness of the crystal and *at least one pattern element of the first plurality of patterns does not overlie a pattern element of the second plurality of patterns in the direction of the thickness of the crystal*, and wherein the *pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

As discussed above, Tsuda does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.* As also discussed

above, Tsuda does not disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, wherein each of the first and the second plurality of patterns take form in pattern elements and *at least one pattern element of the second plurality of patterns does not overlie a pattern element of the first plurality of patterns in the direction of the thickness of the crystal.*

Because Tsuda does not disclose or suggest all the claim requirements of the claim, claim 26 is non-obvious over Tsuda. Moreover, the Examiner has failed to present a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claim 26 be reversed.

C. Rejection of claims 1, 4-6, and 8-10 as unpatentable over Pribat or Tsuda in view of Fleming.

1. Claims 1, 4-6, and 8-10:

Claims 1, 4-6, and 8-10 stand improperly rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,952,526 (Pribat) or U.S. Patent No. 6,294,440 (Tsuda) in view of U.S. Patent No. 6,358,854 (Fleming).

Claims 1, 4-6, and 8-10 are patentable over the cited reference. To establish *prima facie* obviousness of a claimed invention, all the claim requirements must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985, 180 U.S.P.Q. 580, 583 (C.C.P.A. 1974).

Claims 1, 4-6, and 8-10 recite a method of manufacturing a crystal of a III-V compound of a nitride system, the method comprising, among other things, forming a first plurality of patterns of at least one pitch, in one position in a direction of a thickness of the crystal, and forming a second plurality of patterns of at least one pitch, in another position in the direction of the thickness of the crystal, wherein the second plurality of patterns at least partly overlies the first plurality of patterns in the direction of the thickness of the crystal and at least partly does not overlie the first plurality of patterns in the direction of the thickness of the crystal, and *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.*

As discussed above, neither Pribat nor Tsuda disclose or suggest forming a first plurality of patterns of at least one pitch and forming a second plurality of patterns of at least one pitch, *wherein the pitch of pattern elements of the first plurality of patterns and the pitch of pattern elements of the second plurality of patterns are different from each other.* Additionally,

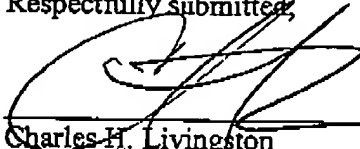
Fleming does not make up for the deficiencies in Pribat or Tsuda. Rather, Fleming discloses a structured layer need not be rectangular bars arranged parallel to each other, but can take on different shapes, sizes and orientations. On page 10 of the Final Office Action, the Examiner asserts that the different shapes, sizes and orientations "will inherently change the pitch of a layer because the pitch is dependent on the width of stripe and width of the interval between strips" and therefore "Fleming does suggest changing the pitch of a patterns [sic]." Although Fleming does indeed teach a variety of different shapes, sizes and orientations that may vary within a structured layer, Appellant maintains Fleming does not disclose or suggest two separate patterns having different pitches from one another. Thus, none of the cited references disclose or suggest this claim element alone or in combination.

Because each of the cited references individually fails to disclose or suggest all of the requirements of claims 1, 4-6, and 8-10, the combination of these references also fails to disclose or suggest all of the requirements of claims 1, 4-6, and 8-10. In addition, the Examiner has failed to present a *prima facie* case of obviousness. Accordingly, Appellant requests the Section 103 rejection of claims 1, 4-6, and 8-10 be reversed.

VIII. Conclusion

As it is believed claims 1, 2, 4-20, and 23-26 are in proper form for allowance, Appellants respectfully request the rejections be reversed and claims 1, 2, 4-20, and 23-26 be allowed.

Dated: October 12, 2004

Respectfully submitted,

By: _____
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